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REMARKS/ARGUMENTS

Claims 1-46 are currently pending. Claims 31, 33, 36, 37, 38, 40. and 41are amended. Claims 43-46 are canceled, without prejudice or disclaimer, by this amendment. Reconsideration and further examination is respectfully requested in view of the below amendments and remarks.

Rejections under 35 U.S.C. §101)

[6] Claims 31-44 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Applicant amended independent claims 31 and 37 to clarify the intended use of the claimed edge-node controller and the core-node controller. Dependent claims 33 and 36 of claim 31, and dependent claims 38, 40, and 41 of claim 37 are also amended for the same purpose.

[7] Claims 45-46 are rejected under 35 U.S.C. 101 because the claimed subject matter is directed to non-statutory subject matter. Claims 45-46 are canceled, without prejudice or disclaimer, by this amendment.

Rejections under 35 U.S.C. §103(a)

[9] Claims 1-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lindskog (US 6,370,572) in view of Graves (US 6,741,572).

In order to render the claims *prima facie* obvious:

(1) The referenced prior art must suggest the desirability of the claimed invention;

(2) Where the teachings of the references conflict, the Examiner must weigh the suggestive power of each reference; and

(3) The claimed invention should not change the principle of operation of a reference.

None of the above requirements has been met in the office action as outlined below and as will be further detailed later.

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With respect to requirement (1), Applicant respectfully points out that the sole objective of Lindskog is overload control through admission control while the main objective of Graves is overload control through modifying resource allocation and rerouting. Lindskog did not consider the role of routing, and Graves did not consider the use of routing metrics. A person skilled in the art would not, therefore, be inclined to suggest the development of routing metrics to control resource allocations, and resource-allocation metrics to determine a provisioning plan based on reading the above references.

With respect to requirement (2) Applicant respectfully points out that while the foundation of the Graves invention is a method of resource-allocation control based on traffic observation, Lindskog teaches away from resource-allocation control. The passage spanning col. 11, line 66 to col. 12, line 3 in Lindskog states: -

"(2) Resource allocation control—The main idea in this case is to move or adapt the network's resources so that they are utilized in the best possible way. However, in today's cellular systems, it is only possible to make rather small adaptations, which will not be enough to handle a mass registration scenario."

Lindskog did not suggest any application where resource-allocation control may be applied, and in fact teaches away from resource allocation as a viable alternative. Consequently, Lindskog does not provide any method or mechanism for resource-allocation control.

With respect to requirement (3), Applicant respectfully points out that the use of routing metrics and resource-allocation metrics in the control system of Graves requires major changes including the creation of route sets, ranking routes within each route set, determining the route depth for each connection, collecting route-depth statistics, etc.

[10] Regarding Claim 1, the Examiner asserts that Lindskog disclosed a multi-stratum multi-time-scale control system for a network.

Applicant respectfully points out that a classical control system of a controlled facility operates by observing the controlled facility (such as network elements), collecting measurements, and then producing a corrective output to influence the

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behavior of the controlled facility. Lindskog discloses a specific control system that uses control agents to analyze the measurements. Please see claim 1 in Lindskog:

"A real time control system for a distributed communications network, comprising:

at least one input data link for receiving real time performance data associated with said distributed communications network;

at least one control agent, for independently analyzing said received real time performance data and accordingly outputting commands to control performance of said distributed communications network; and

at least one output data link for controlling the performance of said distributed communications network based on said real time performance data."

Applicant respectfully points out that there is no resemblance between Lindskog's control system and the control system of the present invention. The present invention is directed to a specific control system which combines routing, resource allocation, and provisioning. As evidenced by the claims, the multi-stratum multi-timescale control system of the present invention comprises routing means, resource-allocation means, and provisioning means. For example, claim 1 recites "...A multi-stratum multi-timescale control system for a network, said system comprising ... routing means operating at a first stratum on a first timescale for providing routing functions ... resource allocation means operating at a second stratum on a second timescale for providing resource allocation functions ... provisioning means operating at a third stratum on a third timescale for providing provisioning functions ..." Lindskog does not provide means for routing, resource-allocation, or provisioning.

With respect to routing means, Lindskog is completely silent about any routing function. There is no reference to routing anywhere in the specification.

With respect to resource-allocation means, the Examiner equates the Real-Time-Performance Measurement System (RTPMS) 12 in Lindskog with the resource-allocation means 102 of the present invention. It is respectfully submitted that the RTPMS is described in Lindskog as a system devised to measure performance while the function of the resource-allocation means of the present

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invention is to allocate channels. Please see Lindskog col. 5 Lines 17-19: "For this exemplary embodiment, the RTPMS 12 functions primarily to measure the performance of the managed network 26 on a real time basis." In contrast, the specifications of the present invention, page 13, line 15, states: "The capacity of edge-to-edge links 310 results from the allocation of channels requested by edge nodes and performed by the resource-allocation function in the core nodes."

With respect to provisioning, the Examiner equates the Real-Time Control system (RTCS) with the provisioning means 103 of the present invention. It is respectfully submitted that the RTCS is described in Lindskog as a system for controlling the performance of a network 26 while the provisioning means of the present invention produces instructions for resource-installation requirements. Please see Lindskog, Column 6, Lines 4-6: "Essentially the RTCS 14 is responsible for controlling the network 26 so that it performs within acceptable bounds." In contrast, the present application page 32, lines 23-25 states: "The provisioning function produces resource-installation requirements". Also see page 33, lines 28-31: "At each provisioning interval, the provisioning function has a resource budget determined by the network operator. Upon the reception of the list of candidate links from the edge controllers and the core controllers, the network controller distributes the resource budget among the candidate links according to established rules."

As such, Lindskog fails to suggest a control system that includes the three features of routing, resource allocation, and provisioning stated in claim 1 of the present invention.

On page 4 of the office action, the Examiner refers to Figures 1, 4, and 5 and column 3 lines 8-17 in Lindskog.

Applicant respectfully points out that Figure 1 in Lindskog is a block diagram of an exemplary distributed communications network management and control system which includes a real-time performance management system, a real-time control system, and a long-term reasoning system. Figure 4 in Lindskog is a diagram which illustrates an architecture that can be applied to realize a pure bar/unbar BSC (Base Station Controller) overload protection control scheme. Figure 5 in Lindskog is

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a diagram that illustrates an example of a BTS (Base Transceiver Station) round trip delay which can be measured. The passage in column 3, lines 8-17 in Lindskog refers to a plurality of control agents which receive real time performance information and does not describe the control system of claim 1 of the present invention.

[12] On page 5 of the office action, the Examiner asserts that Lindskog suggested exploration of art an/or provided a reason to modify the control system with additional feature such as routing means for providing routing functions. Reference is made to Figure 3, column 17 lines 63-65, and column 16 lines 37-44.

Although Lindskog states in Column 16, lines 37-44 " ..... the invention is not limited to the embodiment disclosed, but is capable of numerous rearrangements, modifications and substitutions without departing from the spirit of the invention as set forth and defined by the following claims", Lindskog does not suggest any other application for the disclosed overload control system.

Lines 63-65 of column 17 contain claim 23 which states: "The real time control system of claim 22, wherein said at least one control agent includes means for controlling a plurality of resources managed by a router in said Internet."

Applicant respectfully points out that claim 23 in Lindskog does not suggest the routing means of the present invention which performs route selection functions and route analysis functions as described extensively in the present application. Lindskog's control system is directed to overload control through blocking traffic and utterly nothing was described or suggested regarding a routing function.

[13] On Page 5 of the office action, the Examiner asserts that Graves discloses a control system having routing means operating at a first layer for providing routing functions. Reference is made to the abstract, column 2 lines 12-15, and column 6, lines 4-31.

Graves does indeed disclose a control system in a network comprising routers interconnected through an optical core where wavelength channels connecting the router pairs may be configured in response to traffic fluctuation in order to increase the proportion of traffic that is routed directly through the optical core and, hence,

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reduce the proportion of traffic that would have to be processed at intermediate routers. This very useful feature is unrelated to the subject matter of the present invention. The present invention provides a unique function of using indices derived from the route-selection process in order to influence resource allocation and using indices derived from the resource allocation process to determine requirements for new installations.

[14] **On page 5 of the office action,** the Examiner asserts that it would be obvious to modify the control system of Lindskog with the teaching of Graves to include routing means at the first layer. As described earlier, **Lindskog does not** provide metrics related to any of the three functions of routing, resource allocation, or provisioning and Graves teaches resource allocation (wavelength-channel allocation) **based on observed traffic fluctuation** and not based on routing indices. Lindskog uses traffic measurements to provide overload controls, through traffic blocking, while graves uses traffic measurements to rearrange the transport resources. Combining these two dissimilar systems may produce a hybrid system that has utterly no resemblance to the features of claim 1 of the present invention.

[15] **Regarding claims 2-4,** the Examiner asserts that Lindskog discloses a system wherein the routing functions provide network information in the form of a routing index metric. Applicant respectfully points out that Lindskog does not mention any routing function, and that the novel concept of the routing-index metric provided in the present invention is not contemplated in either of the two cited references.

[16] **Regarding claims 5-7,** the Examiner asserts that Lindskog and Graves disclosed a system wherein the routing-index metric is based on route depth. Applicant respectfully points out that **the route-depth metric is a novel feature of** the present invention (described on page 19 and following pages of Applicants' specification). The route depth is a metric based on the rank of a selected route in a ranked route set. Lindskog does not mention any routing function and Graves does not mention any route sets; ranked or otherwise. The route-depth metric is neither mentioned nor contemplated in either of the two cited references.

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[17] **Regarding claim 8**, the Examiner asserts that Graves discloses means for measuring efficacy of route selection based on the route-index metric. Reference is made to column 9 lines 1-22. Applicant respectfully points out that Lines 1-22 of column 9 in Graves draw the attention to the harmful effect of traffic surges in a network, **depicted in Figure 2C as a prior-art network** using static core connectivity, where traffic may be forced to take multi-hop routes requiring tandem processing at several intermediate routers. Graves solves the problem using Agile Wavelength Switches (ALS) as depicted in Figure 4. Applicant respectfully points out that Graves' solution does not contemplate the use of a routing-index metric.

[18] **Regarding claims 9-10**, the Examiner states that Graves disclosed a system wherein the resource-allocation functions provide the network information in the form of a resource-allocation-index metric. Reference is made to column 4, lines 24-32, column 9, lines 1-22, lines 31-54. As described above, lines 1-22 of column 9 provide an example of poor performance in a hypothetical network described in Graves as an inferior prior-art network. Applicant respectfully points out that Column 4 describes a process of allocating, and reallocating, wavelength channels following temporary traffic surges. Column 9, lines 31-54, also describes dynamic allocation of wavelength channels to follow traffic fluctuations. The resource-allocation index is described beginning on page 24 line 19 of the present application. The Resource Allocation Index for a given resource is based on the number of requirements against the resource and failure of a resource allocation function in satisfying such requirements. This novel metric is neither used nor contemplated in Graves.

[19] **Regarding claim 11**, the Examiner states that Graves disclosed a system comprising means for measuring efficacy of resource allocation based on the resource allocation index metric. As discussed above with reference to item 18, Graves does not use a resource-allocation index, which was first introduced in the present disclosure.

[20] **Regarding claim 12**, the Examiner asserts that Lindskog disclosed a system wherein the resource allocation functions comprise functions which configure the network so as to satisfy resource allocation requirements. Reference is made to

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the passage in column 5, lines 37-47. Applicant respectfully points out that the
passage refers to blocking of subscription requirements while claim 12 of the present
invention refers to resource allocation to avoid blocking requests.

[21] Regarding claims 13-15, the Examiner asserts that Lindskog and
Graves disclosed a system wherein provisioning functions provide the network
information in the form of constituent traffic metric. Applicant respectfully points out
the neither Lindskog nor Graves disclosed a provisioning function. Additionally,
neither contemplated the use of the novel concept of **constituent traffic metrics**
described in the present application on page 17, starting at line 21, and as illustrated
in Figure 20.

[22] Regarding claim 16, the Examiner asserts that Graves disclosed a
system wherein the constituent traffic metric determines network provisioning
requirements. Reference is made to column 2, lines 52-65 and column 3 lines 8-29
which describe path allocation according to traffic level.

The present disclosure makes a clear distinction between the two functions of
resource allocation and provisioning, where the latter is determined according to
metrics of the former. Please see page 11, lines 21-24, and page 32 lines 23-28:

> Page 11 – "Some resources, such as the physical links, are installed
> according to provisioning requirements. Other resources, such as light-paths,
> channel-bands, channels, and TDM time slots, may be re-allocated
> automatically by the network."
>
> Page 32 – "The provisioning function produces resource-installation
> requirements. The provisioning function operates in the long-term time scale,
> where the horizon can range from weeks to months.
> The provisioning function is used to identify the edge-core links 231 and the
> core-core links 232 that need to be augmented, and to calculate the capacity
> that needs to be added."

Furthermore, the constituent-traffic metric was first introduced in the present
disclosure. As described on page 16 of the present disclosure, a route is dynamically
classified as either a primary route or a secondary route. In a preferred embodiment,
the first route in the route set is given primary status, while other routes are given
secondary status. The constituent traffic comprises primary traffic and secondary
traffic. Primary traffic refers to setup tagged connection requests over primary routes

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to which an edge-to-edge link belongs, whereas secondary traffic refers to untagged connection requests carried over secondary routes after being rejected by other primary routes. The notion of using a constituent-traffic metric to determine installation requirements in not contemplated in the cited references.

[23] **Regarding claim 17**, the Examiner asserts that Lindskog and Graves disclosed a system wherein the routing means includes an edge controller, the resource-allocation means includes a core controller, and the provisioning means includes a network controller. Applicant respectfully points out that Lindskog does not consider a routing function, a resource-allocation function, or a provisioning function. The dynamic configuration control system of Graves does include a variety of controllers for the purpose of dynamic resource allocation. Graves, however, does not consider a provisioning function.

[24] **Regarding claim 18**, the Examiner asserts that Lindskog disclosed a system wherein the resource-allocation means and the provisioning means are integrated. Reference is made to Figure 4 in Lindskog. Applicant respectfully points out that there are neither resource-allocation means nor provisioning means in Lindskog. Lindskog provides an overload control means. Further more, Figure 4 clearly indicates that the Real-Time-Performance Measurement System (RTPMS) and the Real-Time Control system (RTCS) are segregated.

[25] **Regarding claim 19**, the Examiner asserts that Lindskog disclosed a system wherein the second stratum and the third stratum are integrated. Applicant respectfully points out that Figure 4 in Lindskog refers to two segregated control systems.

[26] **Regarding claim 20**, the Examiner asserts that Lindskog disclosed a system wherein the second time scale and the third time scale are the same time scale. Reference is made to the passages in column 7 lines 52-58, column 9, lines 18-27, and column 12, lines 31-56. Applicant respectfully points out that the control system of Lindskog does not span three time scales and, therefore, unification of a second and a third time scale would be inapplicable. These passages refer to real-time operations. The passage in column 7 refers to clock synchronization which is a

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rudimentary function in communication networks. The passage in column 9 refers to overload control in a cellular radio system where control decisions are made locally in respective network elements. The passage in column 12 states that the basic requirements imposed on the performance measuring system (RTPMS 12) are that it should be subscription-based and able to deliver the application-specific performance indicators in real time. The passage also identifies the resources to be monitored for overload control.

[27] **Regarding claim 21**, the Examiner asserts that Lindskog and Graves combined disclose a multi-time-scale control method for a network wherein each of successive timescales in the network is coarser than its preceding time scale.

As pointed out earlier, the control system of Lindskog does not include a routing function, a resource-allocation function, or a provisioning function. The control system of Graves includes a real-time routing and a resource-allocation function based on traffic observation. Combining the two references would still be missing a provisioning function.

[28] **Regarding claims 22-23 and 25-30**, the Examiner asserts that the method limitations are similar to the system limitations of claims 2-4 and 10-14. Applicant has clearly contrasted the limitations against the referenced prior art.

[29] **Regarding claim 24**, the Examiner asserts that Graves disclosed a method wherein the measurements are collected for a connection that is denied along the route. Reference is made to column 8, lines 19-28 and column 9, lines 7-22. Applicant respectfully points out that claim 24 of the present invention relates to the function of compiling a routing-index metric (claim 22) which is not contemplated in Graves.

[30] **Regarding claim 31**, the Examiner asserts that Lindskog and Graves disclosed an edge controller comprising means for selecting a route set, means for selecting a candidate route from the route set in order of rank, means for receiving measurements taken along the candidate route, and means for computing a routing index value for the candidate route. The Examiner refers to several passages in Lindskog and Graves. Applicant respectfully points out that Lindskog does not

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consider any routing function let alone devising a route set for each node pair,
ranking the routes of each route set, and computing a routing index. Graves
considers a routing function which does not contemplate the use of a route set or
computation of a routing index.

[31] **Regarding claim 32**, the Examiner asserts that Lindskog disclosed an
edge node controller wherein the measurements include state-information
measurements along the entirety of one of an accepted and a rejected candidate
route. Applicant respectfully points out that the Lindskog reference did not mention
or contemplate routing; hence the reference cannot possibly disclose state-
information measurements taken along an accepted or rejected route. Lindskog
mentioned performance measurements and Base Transceiver Station round trip
delay measurements. The passages of column 3, lines 8-17, and column 6, lines 4-
15, refer to real-time performance measurements and the passages in column 7,
lines 9-27, and column 12, lines 43-56 do not mention measurements.

[32] **Regarding claim 33**, the Examiner states that Lindskog and Graves
disclosed an edge controller wherein the routing index metric is based on route
depth, wherein the routing index metric is based on constituent traffic, and wherein
the routing index metric is based on traffic classification with respect to defined
threshold.

Applicant respectfully points out that there is no explicit or implicit reference to
a routing index or equivalent in either of the two references. Lindskog does not
consider a routing function and even if routing was considered, Lindskog would not
have used the routing-index metric which was first disclosed in the application of the
present invention. A routing-index metric relates to a set of ranked routes for each
pair of edge nodes. Figure 6 and column 15, lines 39-62, in Lindskog relate to a
system for detecting overload in a cell and barring some traffic classes to handle an
overload condition.

Figure 4 in Graves illustrates a network of routers interconnected by Agile
Wavelength Switches (ALS) whose function is to provide an appropriate number of
wavelength paths for each router pair to suit the corresponding traffic level. Figure

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6B illustrates the exchange of messages needed to modify the paths capacities. Figure 7 illustrates an alternative way of controlling the Agile Wavelength Switches. Column 18, lines 39-55, in Graves describes the process of setting cross-points in the Agile Wavelength Switches.

[33] **Regarding claim 36**, the Examiner states that Graves discloses an edge-node controller comprising means for measuring efficacy of route selection based on the routing index. The Examiner refers to column 9, lines 1-22.

Applicant respectfully points out that the concept of routing index, first introduced in the present application, is not considered in the Graves reference. Furthermore, the passage in column 9, lines 1-22, describes problems associated with a rigid network having fixed path capacities and labeled by Graves as prior-art. The invention of Graves avoids the problem by providing agile direct paths of appropriate capacity for each router pair.

[34] **Regarding claim 37**, the Examiner states that Lindskog and Graves combined disclose the core node of claim 37 of the present application.

The core node controller of claim 37 is operable to compute resource augmentation requirements based on failed resource configuration attempts and to transmit the resource-augmentation requirements to a provisioning means for calculating network-wide provisioning requirements based on the resource augmentation requirements. Applicant respectfully points out that neither Lindskog nor Graves provides a network-provisioning function.

[35] **Regarding claim 38**, the Examiner asserts that Lindskog disclosed a core node controller comprising means for computing a resource-allocation index based on the resource augmentation requirements. The Examiner refers to Figure 4, column 5, lines 17-35, column 9, lines 21-45, column 15, line 63, to column 16, line 12.

Applicant respectfully points out that the passage in column 5, lines 17-35, refers to performance measurement. The passage of column 9, lines 21-45, refers to network overload protection, and the passage spanning column 15, line 63, to

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column 16, line 12, refers to **real-time computations for detecting overload** and fine tuning settings (such as **reducing the pace of accepting more load**) in order to improve the system's overall performance.

As described earlier, the novel resource-allocation index of the present invention is not considered in the cited references.

[36] Regarding claim 39, the Examiner states that Graves disclosed a core node controller wherein the resource allocation index is created based on automated measurements of prior resource allocation data. The Examiner refers to column 4, lines 24-32, column 9, lines 1-22 and lines 31-54.

Applicant respectfully points out that the resource allocation index, which is determined based on the first available route in a ranked route set, is not used in Graves.

The passage of column 4, lines 24-32, describes a process of releasing underutilized transmission channels to be available for reallocation where needed.

The passage of column 9, lines 1-22, refers to a network of routers interconnected by paths of fixed capacity, thus necessitating tandem processing at intermediate routers.

The passage of column 9, lines 31-54 describes a dynamic path allocation process to remedy the problem described in column 9, lines 1-22.

[37] Regarding claim 40, the Examiner asserts that Lindskog disclosed a core node controller comprising means for measuring efficacy of resource allocation based on at least some information in the resource allocation index. The Examiner refers to column 6, lines 16-44, and column 7, lines 36-51.

Applicant respectfully points out that Lindskog does not provide a resource allocation function. The passage of column 6, lines 16-44 describes real-time performance control and defines different categories of real-time systems (labeled as hard, firm, or soft). The passage of column 7, lines 36-51 discusses the reliability of performance measurements.

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[38] Regarding claim 41, the Examiner states that Lindskog disclosed a core controller comprising means for determining the severity of the resource allocation requirements and means for sorting the resource allocation requirements. The Examiner refers to Figure 6, column 6, lines 3-15, and column 6, lines 23-44.

Figure 6 in Lindskog relates to a system for detecting overload in a cell (in a radio network) and barring some traffic classes to handle an overload condition. The passage of column 6, lines 3-15 does not refer to resource allocation. The passage of column 6, lines 23-44 defines different categories of real-time systems. There is not mention anywhere in the Lindskog reference of any means for determining resource-allocation requirements.

[39] Regarding claim 42, the Examiner asserts that Lindskog disclosed a core node controller wherein the provisioning means is provided on the core node controller. The Examiner refers to column 6, lines 3-15.

Applicant respectfully points out that the passage of column 6, lines 3-15, describes a real-time control system (RTCS) that is responsible for controlling a network so that it performs within acceptable bounds. Nothing is mentioned, or implied, in the entire Lindskog reference regarding a provisioning function.

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Conclusion

Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicant's Attorney at 978-264-6664, extension 304, so that such issues may be resolved as expeditiously as possible.

In view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

_10/12/05_
Date

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Docket No. 123-021